

CONSERVATION AGREEMENT AND STRATEGY

FOR

COLORADO RIVER CUTTHROAT TROUT

(Oncorhynchus clarki pleuriticus)

in the States of
Colorado, Utah, and Wyoming

March 1999

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Acknowledgments

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CONSERVATION AGREEMENT

COLORADO RIVER CUTTHROAT TROUT (*Oncorhynchus clarki pleuriticus*)

This Conservation Agreement (Agreement) has been developed to expedite implementation of conservation measures for Colorado River cutthroat trout (CRCT) in Colorado, Utah, and Wyoming as a collaborative and cooperative effort among resource agencies. Threats that warrant CRCT listing as a special status species by state and federal agencies and might lead to listing under the Endangered Species Act of 1973, as amended, will be eliminated or reduced through implementation of this Agreement and the attached Conservation Strategy (Strategy).

GOALS

To assure the long-term prosperity of Colorado River cutthroat trout throughout their historic range by establishing two self-sustaining meta-populations, each consisting of 5 separate, viable but interconnected sub-populations, in each Geographic Management Unit (GMU) within the historic range. The short-term goal is to establish one metapopulation in each GMU.

To maintain areas which currently support abundant Colorado River cutthroat trout and manage other areas for increased abundance,

To maintain the genetic diversity of the species, and

To increase the distribution of Colorado River cutthroat trout where ecologically, sociologically, and economically feasible.

OBJECTIVES

To maintain and restore 383 conservation populations in 1754 stream miles and 18 populations in 652 lake acres in 14 GMUs within the historic range.

To eliminate or reduce threats to CRCT and its habitat to the greatest extent possible.

These goals and objectives will be reached through implementation of specific management actions detailed in this Strategy (see Appendix B), and in existing and future conservation agreements/strategies and management plans developed between the signatory agencies and other federal, state, local and nongovernmental agencies. Upon signing, the signatories agree to commit resources in terms of personnel and operational funding to conservation activities described in section IV herein to the extent that progress toward Strategy objectives from the baseline condition is measurable and documented. They also agree to ensure the implementation of those conservation actions detailed in the Strategy. The range-wide status of CRCT will be evaluated annually to assess program progress and amendments will be added to the Agreement and Strategy as appropriate to address newly identified conservation issues and to ensure program effectiveness.

I. OTHER SPECIES INVOLVED

The primary focus of this Agreement is the conservation and enhancement of CRCT and the watersheds in Colorado, Utah, and Wyoming upon which they depend; however, other species occurring within or adjacent to CRCT habitat may also benefit. Some of these species include bluehead sucker (*Catostomus discobolus*), roundtail chub (*Gila robusta*), mountain sucker (*Catostomus platyrhynchus*), mottled sculpin (*Cottus bairdi*), and boreal toad (*Bufo boreas*). Using an ecosystem approach, the CRCT Agreement could reduce or possibly eliminate threats for several of these species.

II. INVOLVED PARTIES

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Denver, CO 80216

Utah Department of Natural Resources
Division of Wildlife Resources
1594 West North Temple
Salt Lake City, UT 84114

Wyoming Game and Fish Department
5400 Bishop Blvd.
Cheyenne, WY 82006

United States Department of Interior
Fish and Wildlife Service
P.O. Box 25486
Denver Federal Center
Denver, CO 80225

Separate Memoranda of Understanding and Cooperative Agreements will be developed with other federal land management agencies such as the U.S. Forest Service, Bureau of Land Management, and National Park Service and other additional, supporting entities as necessary to ensure implementation of specific conservation measures. In addition, interested government agencies and conservation groups will be given opportunity to review and provide input on specific actions.

III. AUTHORITY

The signatory parties hereto enter into this Conservation Agreement and the attached Conservation Strategy under federal and state law, as applicable, including, but not limited to Section 2(c)(2) of

the Endangered Species Act of 1973, as amended, which states that “the policy of Congress is that Federal agencies shall cooperate with State and local agencies to resolve water resource issues in concert with conservation of endangered species”.

All parties to this Agreement recognize that they each have specific statutory responsibilities that cannot be delegated, particularly with respect to the management and conservation of wildlife, its habitat and the management, development and allocation of water resources. Nothing in this Agreement or the Strategy is intended to abrogate any of the parties’ respective responsibilities.

This Agreement is subject to and is intended to be consistent with all applicable Federal and State laws and interstate compacts.

This instrument in no way restricts the parties involved from participating in similar activities with other public or private agencies, organizations or individuals.

The State of Wyoming and the Commission do not waive sovereign immunity by entering into this Agreement, and specifically retain immunity and all defenses available to them as sovereigns pursuant to Wyoming Statute 1-39-104(a) and all other state law.

Modifications within the scope of this instrument shall be made by the issuance of a bilaterally-executed modification prior to any changes being performed.

IV. CONSERVATION ACTIONS

The Strategy clearly outlines the actions to be implemented for the conservation of CRCT over the next three to five years. In addition, four general administrative actions, as outlined below, will be implemented.

Coordinating Conservation Activities

Administration of the Agreement will be conducted by a Coordination Team. The team shall consist of one designated representative from each signatory to this Agreement and may include technical and legal advisors and other members as deemed necessary by the signatories.

The designated team leader will rotate annually among the representatives from the three state wildlife agencies involved.

Authority of the Coordination Team shall be limited to making recommendations for the conservation of CRCT to the Administrators of the signatory agencies.

The Coordination Team will meet annually to develop range-wide priorities, review the annual conservation work plans developed for each state, coordinate tasks and agency resources to most effectively implement the work plan, and review and revise the Strategy as required.

Modifications within the scope of this instrument shall be made by the issuance of a bilaterally-executed modification prior to any changes being performed.

The Coordination Team will meet on a semiannual basis to report on progress and effectiveness of the Strategy implementation.

Coordination Team meetings will be open to the public. Meeting decision summaries and progress reports will be distributed to the Coordination Team and to other interested parties upon request.

Implementing a Conservation Schedule

A total of 10 years is anticipated for completion of all actions identified and specified in the Strategy. The parties agree that significant actions to benefit CRCT will be implemented and documented within the first five (5) years.

Conservation actions will be scheduled and reviewed on an annual basis by the signatory agencies based on recommendations from the Coordination Team. Activities that will be conducted during the first 3-5 years are listed in the Strategy. The Strategy is a flexible document and will be revised annually as necessary.

Each signatory to the Agreement will coordinate, implement and monitor conservation actions they and their cooperators are responsible for as designated in the annual work plan. The Coordination Team will review accomplishments by the signatory agencies and their cooperators in the context of progress toward Strategy goals and objectives.

Funding Conservation Actions

Funding for the Agreement will be provided by a variety of sources. Federal, State and local sources will need to provide or secure funding to initiate procedures and tasks of the Agreement and Strategy.

It is understood that all funds expended in accordance with this Agreement are subject to approval by the appropriate local, state or Federal appropriations. This instrument is neither a fiscal nor a funds obligation document. Any endeavor involving reimbursement or contribution of funds between parties to this instrument will be handled in accordance with applicable laws, regulations, and procedures, including those for Government procurement and printing. Such endeavors will be outlined in separate agreements that shall be made in writing by representatives of the parties and shall be independently authorized by appropriate statutory authority. This instrument does not provide such authority. Specifically, this instrument does not establish authority for noncompetitive awards to the cooperator of any contract or other agreement. Any contract or agreement for training or other services must fully comply with all applicable requirements for competition.

Conservation Progress Assessment

An annual range-wide assessment report of progress towards implementing actions identified in this Agreement will be provided to the signatory agencies by the Coordination Team. Copies will be made available to cooperators and interested parties upon request.

V. DURATION OF AGREEMENT

The initial term of this Agreement shall be five (5) years. Prior to the end of each 5 year period, a thorough analysis of actions implemented for the species will be conducted by the Coordination Team. If all signatories agree that sufficient progress has been made towards the conservation of CRCT this Agreement shall be extended for an additional 5 years. Any party may withdraw from this Agreement on sixty (60) days written notice to the other parties.

VI. NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) COMPLIANCE

Signing this Agreement is covered under authorities outlined in section III listed above. We anticipate that any survey, collection or non-land disturbing research activities conducted through this Agreement will not entail significant Federal actions under NEPA and will be given a categorical exclusion designation. However, each signatory agency holds the responsibility to review planned actions for their area of concern to ensure conformance with existing land use plans and to insure NEPA compliance.

VII. FEDERAL AGENCY COMPLIANCE

During the performance of this Agreement, the participants agree to abide by the terms of Executive Order 11246 on non-discrimination and will not discriminate against any person because of race, color, religion, sex or national origin.

No member or delegate to Congress or resident Commissioner, shall be admitted to any share or part of this Agreement, or to any benefit that may arise therefrom, but this provision shall not be construed to extend to this Agreement if made with a corporation for its general benefit.

VIII. SIGNATORIES

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CONSERVATION STRATEGY

COLORADO RIVER CUTTHROAT TROUT (*Oncorhynchus clarki pleuriticus*)

INTRODUCTION AND BACKGROUND

This Conservation Strategy has been initiated by the wildlife agencies in Colorado, Utah and Wyoming to reduce threats to the subject species, to stabilize and enhance its populations, and to maintain its ecosystems. This document's primary purpose is to conserve this species through interim conservation measures under the Endangered Species Act (ESA) of 1973, as amended.

This Strategy has been developed to provide a framework for the long term conservation of Colorado River cutthroat trout (CRCT), and to reduce or eliminate the threats that warrant its status as a sensitive species or species of special concern by federal and state resource agencies. To address these threats, there must be a strong effort towards restoration and a clear allocation of resources for that purpose. To be most effective, this Strategy must be implemented in its entirety.

The Strategy is based on work plans and programs developed by state wildlife management field units and cooperating federal, state, local and nongovernmental agencies in each of the three states. Five conservation plans for CRCT in the three states (Sealing et al. 1992, Interagency Plan 1993 and 1994, Langlois et al. 1994, UDWR 1997) were being implemented independently prior to the initiation of this Strategy. In 1994, member states of the Colorado River Fish and Wildlife Council (a consortium of State Fish and Wildlife agency directors) recognized the need for state wildlife agencies to coordinate conservation actions for the Colorado River cutthroat trout and other native species, and directed Colorado, Utah, and Wyoming to develop a coordinated approach. This Strategy is the product of that decision. The first draft of the Strategy (CRCT Conservation Task Group, 1996) identified several issues and technical questions which needed resolution.

In April, 1997, the Colorado River Fish and Wildlife Council (CRFWC), acting on the advice of the CRCT Conservation Task Group, established a two-level committee structure to resolve these items. A Coordination Committee was assigned to facilitate inter-agency communication and a Biology Committee was assigned to provide technical input on the identified questions. Names and affiliations of members of these committees, along with names of other reviewers and participants, are provided (see Acknowledgments). Although consensus was not reached on some questions because substantive comments were not available at the appropriate point in the consensus building process, a great deal of progress was made. Highlights of the decisions and remaining questions are outlined in a later section.

STATUS AND DISTRIBUTION OF THE SPECIES

The Colorado River cutthroat trout occupied portions of the Colorado River drainage in

Wyoming, Colorado, Utah, Arizona, and New Mexico historically (Behnke 1992). Its original distribution probably included portions of larger streams, such as the Green (Simon 1935), Yampa, White, Colorado, and San Juan rivers. Behnke and Zarn (1976) suggested this subspecies was absent from the lower reaches of many large rivers because of summer thermal barriers. However, other subspecies of cutthroat trout have demonstrated seasonal migrations over 100 km, usually upstream in spring and downstream in autumn (Bjornn and Mallet 1964). Brown trout have moved over 35 km in late fall to habitats considered marginal in summer (Meyers et al. 1992). It is feasible to speculate that the lower reaches of the rivers within the Colorado River cutthroat trout range may have become acceptable habitat in winter as water temperatures moderated and this may partially explain the disjunct historical distribution apparent for this subspecies. Remaining populations now occur mostly in headwater streams and lakes. Young (1995) determined most lotic populations were in isolated, headwater streams with average daily flows less than 0.85 m³/s (30 cfs). Stream gradients usually exceeded 4%, and all fish were found above 2,290 m (7500 ft). Considerable research has been focused on inland cutthroat trout in general and Colorado River cutthroat trout in particular. Summaries of the life history and ecological requirements of this subspecies may be found in Behnke (1979, 1992), Behnke and Zarn (1976), Young (1995), and Young et al. (1996). Further references on the Colorado River cutthroat trout and topics related to their conservation and management are included in a bibliography included in this Strategy.

Without doubt, the distribution and abundance of Colorado River cutthroat trout have declined (Young 1995, Martinez 1988, Binns 1977, Behnke and Zarn 1976). Behnke (1979) stated that the Colorado River cutthroat trout occupied less than 1% of its historical range. Young (1995) indicates most adfluvial stocks have been lost, though some populations have been reestablished in lakes in Rocky Mountain National Park from a population stocked in the Williamson lakes, California, in 1931 (Pister 1990). These reviews were based on summaries of information contained in various agency reports. The authors, however, did not conduct range-wide population or field surveys to generate their reports. The information contained in these reports, therefore, give a general overview of the decline of the subspecies but they do not contain specific information on the subspecies' status throughout its range.

Colorado River cutthroat trout have hybridized with non-native salmonids in many areas and consequent impacts to the genetic integrity of this exposure to introduced salmonids is clearly recognized as a major influence upon the status of most native cutthroat trout subspecies. Although there is still some disagreement about the role that hybridized populations should play in status determinations and conservation strategies of any species, recent clarifications of the U.S. Fish and Wildlife Service policy on this topic provide guidelines which were used in this document. These guidelines were interpreted in terms of genetic purity definitions for CRCT, which suggest that populations with genetic purity ratings of B, B+, A- or A meet the intent of the policy and provide a practical and meaningful framework for assessing the status of the species. Populations meeting this genetic criterion are defined as conservation populations for this strategy.

Colorado River cutthroat trout is designated as a special status species by Colorado, Utah and Wyoming. Prior to 1995, this fish was a Federal Category 2 candidate species, but does not occur

in the candidate list proposed by the U.S. Fish and Wildlife Service in 1996 (50 CFR Part 17, 61 FR 7600). Use of categories 1, 2, etc. was eliminated in this proposed rule. The Colorado River cutthroat trout is classified as a sensitive species by Regions 2 and 4 of the USFS and by the BLM.

The basis for any status determination relies on the most comprehensive and up-to-date assessment of existing populations. Given the ongoing conservation actions being implemented through existing plans in Colorado, Wyoming, and Utah, which included inventories of known and “new” CRCT populations and further morphometric and genetic tests for relative purity, past status assessments (e.g. Young et al. 1996) are dated and new information is available. During the spring of 1998, the Coordination Committee instructed agency biologists to compile this information on existing CRCT waters in their areas as a first step in determining the numbers of pure, viable populations within the tri-state area.

The CRFWC Committees agreed that most waters within the historic range are potential CRCT waters, and developed an electronic database to hold, for all waters, data which the Committees agreed are important in evaluating the rangewide status of CRCT. The data available as of July 1, 1998 are presented as Appendix A. This database may be queried on the basis of one or several of these data points to generate range-wide listings of waters reflecting many different perspectives. The baseline database contains information on stream miles or lake acres occupied by each population, genetic purity rating, numbers of CRCT > 150 mm (6 in), type(s) of barrier(s), type(s) of other salmonid(s) present, CRCT stocking history, and limiting habitat factors.

The numbers of, and stream mileage or lake acreage occupied by, conservation populations of CRCT with genetic purity ratings of B, B+, A- or A totaled 161 in a minimum of 524 stream miles and 12 in 601 lake acres (Table 1). These results show pure and essentially pure populations of CRCT are still represented in many stream drainages across the three states. Though the bulk of the existing populations are found in only five of the 14 geographic management units (GMU), some pure or essentially pure populations are present in every GMU, and provide a potential to maintain and enhance the genetic diversity of this subspecies.

The assessments contained herein have been influenced by the approach that each state used to determine and designate the presence of hybrids within populations. Within Colorado and Wyoming the state management agencies use a hybrid classification scheme that incorporates meristic, morphometric, and molecular characters to represent the range of hybrid variability. Within Utah, their interagency conservation team has adopted an approach that ranks hybrid populations based on historic stocking records as well as meristic, morphometric, and molecular characters. Both of these approaches provide a mechanism for determining the value of an individual population for conservation efforts based on the degree that individual fish within it may be hybridized.

There is still some uncertainty about the numbers and status of remaining populations of CRCT. The number of populations that ultimately should be managed for the long-term conservation of this subspecies, therefore, exceeds the 173 populations included in this status assessment (Appendix A). Pending completion of Utah’s index approach to rating genetic purity,

over 200 populations in that state have not been evaluated for genetic purity. It is feasible that the number of conservation populations currently in Utah will expand to equal or exceed levels observed for Colorado and Wyoming. In Colorado, 20 to 30 populations that were founded many years ago from Trappers Lake stock await a final determination on the genetic purity of that stock before their status in conservation planning can be assessed. The issues surrounding a method for measuring viability or stability of the different populations also need to be resolved. However, there is no doubt that significant conservation actions must be implemented to prevent further decline of this fish.

In 1996, the U.S. Fish and Wildlife Service and the National Oceanic and Atmospheric Administration proposed and adopted policy rules that influence a status assessment and conservation of Colorado River cutthroat trout: 1) The proposed Policy on the Treatment of Intercrosses and Intercross Progeny (the issue of hybridization)(50 CFR Part 424, 61 FR 26), and 2) the Policy Regarding the Recognition of Distinct Population Segments under the Endangered Species Act (50 CFR Part IV, 61 FR 26). The proposed policy in (1) has not been finalized.

The proposed Intercross Policy asserts that the U.S. Fish and Wildlife Service's responsibility for conserving species under ESA extends to hybrids (intercrosses) if (1) the progeny share traits that characterize the taxon of the listed parent, and (2) the progeny more closely resemble the listed parent's taxon than an entity intermediate between it and the other known or suspected non-listed parental stock. The proposed policy also makes the distinction that it applies to individuals not to populations. Populations can contain individuals that represent the protected species and individuals that are intercross progeny between the protected species and another.

The policy regarding distinct population segments (DPS) requires that the U.S. Fish and Wildlife Service consider three elements in decisions regarding the status of a possible DPS: (1) discreteness of the population segment in relation to the remainder of the species to which it belongs; (2) the significance of the population segment to the species to which it belongs, and (3) the population segment's conservation status in relation to ESA standards for listing. This policy recognizes the importance of unique taxonomic units in the conservation management of a species.

The application of these policies to the conservation of Colorado River cutthroat trout requires that the status assessment be continued by compiling information for each individual population. In this manner, the influence of hybridization and the presence of unique characteristics of distinct population segments can be determined across and within the designated GMUs. It follows that populations may need to be conserved throughout the range that contain varying degrees on hybridization.

Table 1. Numbers and miles/acres of CRCT conservation populations in Colorado, Utah and Wyoming known to exist on July 1, 1998.

Geographic Management Units	Existing CRCT Populations			
	In Streams		In Lakes	
	numbers	miles	numbers	acres
State of Colorado-Total	87	230.3+	9	496.4
Colorado	47	107.1	7	171.4
Dolores	3	2.5+	0	na
Gunnison	3	10.0+	0	na
San Juan	12	35.7	0	na
White	4	11.0	1	287.0
Yampa	18	64.0	1	38.0
State of Utah-Total	8	36.0+	0	na
Northeastern	4	30.0	0	na
Southeastern	2	6.0+	0	na
Southern	2	0.0+	0	na
State of Wyoming-Total	66	258.0	3	104.5
Black's Fork/Eastside	9	42.4	0	na
East Fork	2	11.0	1	28.0
Little Snake	32	90.9	0	na
Upper Green	3	17.3	1	5.5
Westside	20	96.4	1	71.0
Grand Total	161	524.3	12	600.9

+ = mileage or acreage information is incomplete

DEFINITIONS AND ISSUES

A. Geographic Management Unit:

The range of the Colorado River cutthroat has been divided into 14 geographic management units (GMUs) to bring a finer level of resolution to descriptions of population and habitat distribution and related maintenance and restoration work. These GMUs reflect common sense divisions of large areas based on river drainages. They do not necessarily reflect important differences in genetic variability in the fish based in geography or other types of adaptation to specific environments. As knowledge of the genetic variability of the fish increases, planning and management should become increasingly based on conservation of the range of distinct population segments (DPS) that comprise the genome of the subspecies. This conceptual approach is assumed to be analogous to evolutionarily significant units (ESUs) as summarized by Monroe and Nielsen (1994).

B. Genetic Purity:

Colorado and Wyoming have adopted the following definitions of genetic purity in order to provide consistency in interpretation of the various techniques which are available to assess genetic purity:

- A+: A pure population with unique phenotypic, genetic or historical qualities that suggest special consideration and use for it in conservation planning.
- A: A pure population with no evidence of hybridization with non-native salmonids.
- A-: A population that is phenotypically representative but that has slight differences from the norm due to natural variation or human-caused movement of CRCT from other areas.
- B+: A population where less than 5% of genetic markers or phenotypes indicate hybridization with non-native salmonids.
- B: A population where 5% or more but less than 10% of genetic markers or phenotypes indicate hybridization with non-native salmonids.
- B-: A population where 10% or more but less than 15% of genetic markers or phenotypes indicate hybridization with non-native salmonids.
- C: A population where 15% or more but less than 20% of genetic markers or phenotypes indicate hybridization with non-native salmonids.
- D: A population where 20% or more of genetic markers or phenotypes indicate hybridization with non-native salmonids.

Although this system could be condensed to a four level system where A-rated populations would be those with no indication of hybridization and B-rated populations would be those where fewer than 15% of genetic markers or phenotypes indicate hybridization, the gradations in these A and B categories provide the resolution that may help fine tune genetics management as more genetics information is gathered. All Colorado and Wyoming populations with genetic information available are described using this system.

Utah proposes to describe the genetic purity and potential for hybridization of their populations using an index based on stocking history, meristic information, and molecular data. This method has not been fully implemented and it is unclear how it compares to the method in use in Colorado and Wyoming.

C. Viability or Stability:

The Coordination Committee adopted a definition of population viability based on criteria from Rieman and McIntyre (1993). However, further study by the Biology Committee determined that these criteria were not helpful to the CRCT conservation program at this time. Some small, isolated populations of CRCT have been stable for many years and it is clear that there are significant uncertainties surrounding ecological requirements for persistence of this species.

The Combined Committees agreed on the need for a consistent way to describe the condition of the different populations across the range of CRCT so that it would be clear which populations were stable and which were at risk of decline. They developed the concept of a stability index that would describe the variation in condition over the range of existing populations using factors known to be critical to CRCT survival. Although such an index would not predict absolute viability or probability of persistence, it could give flexibility in describing CRCT populations as they exist today and provide a framework for measuring progress in improving the conditions for those populations.

However, after considerable effort toward developing this index within the necessary time frame, there was still enough uncertainty among team members on its structure and utility that the concept was tabled until a decision could be made either to continue with its development or use simpler measures of stability.

D. Baseline:

The Combined Committees agree and want to emphasize that most waters in the historic range of CRCT are potential restoration areas. Factors such as presence of hybrid fish or absence of barriers should not be viewed unilaterally as precluding inclusion of the water in the CRCT restoration process. To facilitate this broader perspective, the baseline for CRCT conservation in the tri-state area was defined as all waters with potential to support CRCT given appropriate management.

Rather than selecting a single subset of these waters as a standard for assessing the range-wide population, a database was developed to hold, for all waters, data which the Committees agreed are important in evaluating the status of CRCT. The database can then be queried on the basis of one or several of these data points to generate range-wide listings of waters reflecting many different perspectives. The baseline database contains information on stream miles or lake acres occupied by each population, genetic purity rating, numbers of CRCT > 150 mm (6 in), type(s) of barrier(s), type(s) of other salmonid(s) present, CRCT stocking history, and habitat limiting factors. A table of data available as of July 1, 1998 is presented in Appendix A.

E. Conservation Population:

A water contains a CRCT conservation population if the fish in that population are rated A-, A+, B+, or B using the genetic purity definitions presented in C. above. These fish could be described as “pure or essentially pure”, and are considered to be important for conservation of the subspecies. Protection of hybrids is consistent with the U.S. Fish and Wildlife Service proposed policy on the Treatment of Intercrosses and Intercross Progeny (Federal Register 61(26), 02/07/96).

Since one of the goals of the CRCT Conservation Strategy is to preserve as much CRCT genetic diversity as possible, it may be necessary to protect a small amount of hybrid influence in order to preserve a larger amount of CRCT diversity. This definition addresses these policy guidelines and strategy goals while honoring the overall intent of species restoration efforts.

A water contains a CRCT conservation population if it is reproducing and recruiting as a geographically distinct group, and meets the genetic purity criteria of “B” or better, or is being managed through periodic stocking for the purpose of maintaining a genetic refugia. Naturally-reproducing conservation populations equate to sub-populations within a meta-population. Genetic refugia populations maintained by stocking will serve as an interim management tool while working toward metapopulation objectives.

F. Hybrid

The term applies to individual fish, not to populations, and is considered to be a fish that has cross-bred with other salmonids, commonly rainbow trout or other cutthroat subspecies. Populations containing hybrids offer genetic and ecological value to conservation efforts. The number of individuals and/or genes in a population that are hybrids can vary from population to population. The percentage of hybrid genes expressed in populations therefore, can be used as a relative measure of hybridization. This measure can be used as a component to assess the role of those populations in the conservation of the subspecies.

G. Metapopulation

A collection of localized populations that are geographically distinct yet are genetically interconnected through natural movement of individual fish among conservation populations.

H. Phenotype

The physical manifestation of the interaction of an organism's genetic information with its environment which results in a unique physical, physiological or behavioral trait.

PROBLEMS CONTRIBUTING TO THE DECLINE OF THE SPECIES AND HOW THEY ARE BEING MANAGED

A. Present or threatened destruction, modification or curtailment of the species' habitat or range:

Young (1995) determined that introductions of non-native salmonids may have had the greatest effect on Colorado River cutthroat trout. Stocking of these non-native salmonids has been widespread since before 1900. Non-native salmonids affect populations of Colorado River cutthroat trout in different ways. Brook trout are known to replace most subspecies of inland cutthroat trout when in sympatry, especially at lower elevations and in low-gradient streams (Oberholtzer 1990, Fausch 1989, Behnke and Zarn 1976, Eiserman 1958). Competition is often suspected as the mechanism leading to replacement, but this has not been demonstrated (Fausch 1988; Griffith 1988). Nonetheless, water temperature can affect the outcome of competitive interactions between these species (DeStaso and Rahel 1994), and this may confer a competitive advantage to brook trout at lower elevations.

Rainbow trout and non-native subspecies of cutthroat trout readily hybridize with Colorado River cutthroat trout and produce fertile offspring (Martinez 1988, Behnke and Zarn 1976, Snyder and Tanner 1960). Introductions of non-native salmonids into existing populations of native trout populations have ceased, and do not represent an ongoing practice or expanding threat.

A wide variety of land management practices have been suggested to affect populations of Colorado River cutthroat trout, including overgrazing (Binns 1977), heavy metal pollution (Oberholtzer 1987, Jespersen 1981, Quinlan 1980), and water depletion and diversion (Jespersen 1981). Some of these practices have served to isolate upstream populations of Colorado River cutthroat trout and protected them from invasion by non-native salmonids, but they also serve to fragment streams, restricting movement between formerly connected populations and creating small, isolated populations that may be more liable to go extinct. Even when the effects of land management are discernable, the consequences for fish may be unknown. Young (1995) describes an example of differential habitat effects where production of juvenile trout benefited at the expense of adult habitat. Behnke and Benson (1980) have described the Colorado River cutthroat trout as the "canary in the mine" with regard to habitat degradation, but it has also persevered in suboptimal habitats. Binns (1977) found that Colorado River cutthroat trout persisted sometimes in marginal and degraded habitats, and often as the only fish species. Behnke and Zarn (1976) reported that Colorado River cutthroat trout persisted in such habitats despite introductions of rainbow trout.

Habitat problems are viewed as site specific and not an overall threat throughout the range. Wyoming has implemented a number of on-going watershed projects (e.g. Little Mountain, Labarge) that focus on entire systems and permit reconnection of stream populations to enhance metapopulations. Colorado has directed through policy that native cutthroat and their habitat shall be protected from stocking of non-native salmonids and whirling disease. Utah has established a statewide stocking policy which directs that stocking for sportfishing recreation will be consistent with native cutthroat trout conservation programs, goals, and objectives.

Existing headwater habitats that already support wild trout populations are being converted to native trout habitat. Colorado River cutthroat trout reclamation projects started within Rocky Mountain National Park in 1979, and other projects are being completed through reclamation projects funded by GO Colorado Legacy grants (Yampa River) and CUP mitigation grants (Colorado River). Federal land management agencies (FS and BLM) are signatory participants with responsibilities for habitat enhancement in Utah's conservation agreement and strategy for Colorado River cutthroat trout.

B. Overutilization of the species for commercial, recreational, scientific or educational purposes:

Overharvest due to unrestricted angling may pose a threat to populations of this subspecies (Young 1995). Quinlan (1980) and Eiserman (1958) report instances wherein Colorado River cutthroat trout demonstrated an ease of capture by anglers that could be translated into vulnerability to overharvest. Overharvest is not considered a problem. Special regulations specifying catch-and-release, very limited harvest, and terminal tackle restrictions have demonstrated effectiveness in maintaining trout populations in the face of a wide range of fishing pressure, and have been applied as standard to native cutthroat waters in all three states. Location of CRCT populations in remote headwater drainages and small streams with difficult access has had an isolating, protective effect from fishing pressure. The tendency for these populations to be composed largely of small-sized fish has also served to protect these populations from angling pressure. Wyoming has closed some cutthroat waters to fishing to prevent excessive angler harvest. The National Park Service has closed four waters to fishing to protect broodstocks, small populations, and spawning fish. The Colorado Division of Wildlife is considering expanding the use of closures to protect important conservation populations of native cutthroat trout (Krieger et al. 1998). Monitoring of wild native cutthroat trout populations that support fisheries is a continuous process in all three states.

C. Disease or predation:

Cutthroat trout are susceptible to common salmonid diseases, including whirling disease (WD). WD is caused by the myxosporean *Myxobolus cerebralis* (Markiw 1992). Colorado River cutthroat trout exposed to *M. cerebralis* in the wild in sentinel fish experiments suffered significantly greater mortality from the infection than most other non-native salmonids (Nehring 1998). Very little is known about other diseases and parasites of this subspecies. Young (1995) found that cutthroat may not avoid predators as well as some other salmonids.

Transmission of diseases to wild cutthroat populations through hatchery-based fish stocking is recognized as the most significant potential threat. In Wyoming and Utah, statewide policies and regulations address fish health status, disease certification of stocked and imported fish, and stocking protocols, which are designed to reduce disease threats. Fish testing positive for whirling disease in Wyoming and Utah hatcheries will not be stocked. In addition, established wild populations are not stocked. In Colorado, a specific policy on WD clearly designates native cutthroat trout waters and other wild trout habitats that are WD negative as the most protected category (AAA), and that only fish that have tested negative for WD using polymerase chain reaction (PCR) protocol may be used to release into these habitats, and these tests must be performed within 60 days of the desired stocking date. Colorado also implements regulations for disease-free certification for fish importation for seven salmonid pathogens. Colorado has policies on the use of isolation/quarantine units within the state hatchery system to facilitate working with wild native cutthroat stocks for propagation objectives without increasing risk of transmission of salmonid disease pathogens. Aggressive implementation of these state regulations and policies is being accomplished and serves as the best approach to minimizing disease threats.

D. Absence of regulating mechanisms adequate to prevent decline of the species or degradation of its habitat:

Colorado River cutthroat trout is designated as a special status species by Colorado, Utah and Wyoming. The fish is classified as a sensitive species by Regions 2 and 4 of the USFS and by the BLM. As such, native cutthroat trout populations are protected by state regulations concerning stocking restrictions, fishing closures, harvest and gear restrictions, stream barriers to fish passage, and disease control. These approaches are considered to be effective in reducing the threats of hybridization with other salmonids, overharvest by angling, and disease (Bennett et al. 1996). Further federal protection for Colorado River cutthroat trout habitat is found in the Clean Water Act, NEPA, and other federal mandates such as the U.S. Forest Service Sensitive Species and Wilderness Areas programs. In conjunction with state species management objectives for native cutthroat trout, these federal mandates make protection and enhancement of their habitat both high profile and high priority within these federal agencies. In Colorado, the Division of Wildlife and National Park Service have placed the highest priority on protection of native cutthroat trout populations. The Division of Wildlife has implemented regulations consistent with its Statewide Fish Management Policy and Whirling Disease Policy. These regulations prevent the stocking of non-native salmonids in CRCT populations, and minimize their exposure to WD and other diseases through stocking restrictions and rigorous disease testing of wild and hatchery salmonid populations. Threats to depletion of stream flow regimes are reduced through filing for minimum instream flow rights with the Colorado Water Conservation Board. As of 1996, 7,255 stream miles in 1,222 stream segments are protected by decree, including waters within the Colorado, Gunnison, San Miguel, Yampa, White, San Juan and Dolores rivers (CWCB 1996). Regulatory controls of water quality in Colorado are implemented by the Colorado Water Quality Control Division and Commission. Water quality standards are already in place to protect the maintenance of aquatic life in coldwater environments, and special resource restrictions are also available to provide further site-specific protection to water quality. In Wyoming, the State Division of Environmental Quality implements water quality

regulations and controls. The Wyoming Game and Fish Department has submitted instream flow filings for 29 stream segments (103 miles) to protect stream flows for CRCT. In Utah, threats to CRCT populations are being addressed through an existing conservation agreement and strategy approved by the state's Division of Wildlife Resources and Reclamation Mitigation and Conservation Commission, and the U.S. Fish and Wildlife Service, Bureau of Land Management, Forest Service, and Bureau of Reclamation (UDWR 1997). Therefore, lack of regulating mechanisms to prevent species decline or habitat degradation does not constrain this conservation effort.

E. Other natural or manmade factors affecting continued existence of the species:

The impacts of stocking of non-native trout species on native cutthroat trout populations, and the use of hatchery-raised fish to augment wild populations are two significant areas of concern. The first of these issues has been addressed in all three states as evidenced above in the description of management policy and priorities for native cutthroat trout populations and habitat, disease control, and fishing restrictions. Information provided herein regarding the assessment of the baseline of existing populations and their genetic purity status demonstrates the management concern being devoted to maintaining the genetic integrity of existing wild stocks and populations. Protocols are described for the appropriate use of fish from wild populations for captive broodstock development, reclamation projects resulting in new populations, and translocations based on genetic purity rating. Stocking of non-native trout by private interests is regulated in Colorado, Utah, and Wyoming to protect native cutthroat populations. Stocking of native cutthroat trout is used to restore naturally functioning populations within historic range. This process is guided by genetic protocols and quantifiable population objectives. The intent of this tri-state strategy is to make these protocols and objectives consistent among the natural resource agencies charged with management responsibilities over CRCT and their habitat. In Wyoming policy has been developed that enables CRCT to be provided to private landowners if such action will benefit cutthroat management objectives. Colorado has developed a conservation agreement process to promote the expansion of native cutthroat trout populations in privately-owned waters.

CONSERVATION STRATEGY

The primary goal of the Conservation Strategy for Colorado River cutthroat trout is

To assure the long-term prosperity of Colorado River cutthroat trout throughout their historic range by establishing two self-sustaining meta-populations, each consisting of 5 separate, viable but interconnected sub-populations, in each GMU within the historic range. The short-term goal is to establish one metapopulation in each GMU.

The cooperators envision a future where Colorado River cutthroat trout swim freely and reproduce naturally in as much of their historic range as possible.

Further goals of the Conservation Strategy are:

To maintain areas which currently support abundant Colorado River cutthroat trout and manage other areas for increased abundance,

To maintain the genetic diversity of the species, and

To increase the distribution of Colorado River cutthroat trout where ecologically and economically feasible.

The objective of the Conservation Strategy for Colorado River cutthroat trout is

To maintain and restore 383 conservation populations in 1754 stream miles and 18 populations in 652 lake acres in 14 GMUs within the historic range.

Objective setting for Colorado River cutthroat conservation will necessarily be a fluid and adaptive process. Although this objective is presented in terms of numbers of populations and the miles or acreages that they occupy, the most meaningful framework for conservation activity is the long-term stability of the at-risk species and ecosystem. This objective embodies the concept that to maintain and restore a population involves work to increase the ecological stability of the population if it is less than optimum.

In Utah, future objectives will be based on historically occupied stream miles categorized by stream order to ensure that all historical stream and watershed types are represented. Colorado has estimated as much as 900 stream miles in 171 streams may be suitable as CRCT habitat (Bennett et al. 1996). All three states should be moving toward objectives set within DPS/ESUs instead of GMUs (see Item A, Definitions and Issues section) and toward an approach that better addresses the issues surrounding long-term stability. Until these improvements are implemented, however, the objective above is described in more detail in Table 2.

Table 2. Long-term objectives for numbers and miles/acres of CRCT conservation populations in Colorado, Utah and Wyoming set as of December 1, 1998.

Geographic Management Units	CRCT Population Objectives			
	In Streams		In Lakes	
	numbers	miles	numbers	acres
State of Colorado-Total	111	324.6	15	547
Colorado	50	121.6	13	222
Dolores	9	23.0	0	na
Gunnison	15	60.0	0	na
San Juan	12	35.0	0	na
White	7	21.0	1	287.0
Yampa	18	64.0	1	38.0
State of Utah-Total	52	537	0	na
Northeastern	33	432.0	0	na
Southeastern	11	70.0	0	na
Southern	8	35.0	0	na
State of Wyoming-Total	220	892.8	3	105
Black's Fork/Eastside	48	242.0	0	na
East Fork	4	22.0	1	28.0
Little Snake	60	198.0	0	na
Upper Green	12	65.8	1	6.0
Westside	96	365.0	1	71.0
Grand Total	383	1754.4	18	652

The Conservation Strategy includes three primary activities. These are

Protecting existing and restored ecosystems,

Restoring degraded ecosystems, and

Planning

Strategies within each activity are outlined below.

Protecting existing and restored ecosystems:

Strategy 1: Construct in-channel barriers.

In-channel barriers will be constructed downstream of the meta- or sub-populations which are at risk from invasion from non-native fish species or hybridized cutthroat populations. Maintenance schedules appropriate to each type of barrier will be developed, and maintenance work funded and completed.

Strategy 2: Regulate angling and enforce regulations.

Populations of CRCT will be protected from overharvest or excessive fishing mortality by appropriate fishing regulations. Fishing regulations will be enforced and monitored to ensure that their objectives are met.

Strategy 3: Prevent introduction of non-native fish species.

Regulations concerning stocking of hatchery reared fish and human movement of resident fish will be enforced to ensure that populations of CRCT remain free of introduced non-native species. Education and information activities explaining the reasons for prohibitions against non-native stocking in cutthroat waters will also be used.

Strategy 4: Monitor CRCT populations to detect changes.

Monitoring processes for CRCT populations, with emphasis on accurate assessment of total adult cutthroat populations and relative abundance of native non-game species, will be developed and implemented.

Strategy 5: Monitor watershed conditions to detect changes.

Standards and guidelines for watershed management in CRCT ecosystems will be developed in concert with responsible land management agencies and followed over the long term. Monitoring processes designed to accurately detect changes in watershed conditions will be

developed and implemented.

Strategy 6: Monitor lake and stream habitats to detect changes.

Standards and guidelines for lake and stream habitat management in CRCT waters will be developed in concert with responsible land management agencies and followed over the long term. Monitoring processes designed to accurately detect changes in lake and stream habitats will be developed and implemented.

Strategy 7: Monitor instream flows, lake levels, and water quality to detect changes.

Minimum instream flows and lake levels, and water quality standards will be monitored so that optimum conditions are maintained over the long term.

Strategy 8: Prevent introduction of *Myxobolus cerebralis*.

Guidelines for preventing introduction of *M. cerebralis* to CRCT waters will be developed and followed.

Strategy 9: Implement interpretive and educational programs.

Public education and awareness is critical to the conservation and restoration of CRCT. Programs designed to educate various angling and non-angling publics about the unique qualities of the species, to increase understanding and support for management activities, and to promote cooperation and communication will be established. In addition, linkages with local programs which will allow students, anglers and others to participate in conservation of local CRCT ecosystems and watersheds will be explored.

Restoring degraded ecosystems:

Strategy 10: Improve watershed conditions.

Colorado River cutthroat trout habitat requirements will be considered on watersheds designated for CRCT restoration. They will be surveyed and site plans developed in concert with responsible land management agencies to mitigate adverse impacts of watershed activities on water quality, instream habitat, channel morphology, riparian areas, and population stability.

Strategy 11: Improve lake and stream habitat.

Habitat improvement techniques will be used where appropriate to provide missing habitat components or improve existing ones. These techniques can include building instream structures to improve pool to riffle ratios, streambank stabilization, riparian management,

instream cover, pool or spawning gravel enhancement, and provision of fish passageways.

Strategy 12: Acquire adequate instream flows and lake levels, and meet water quality standards.

All legal avenues for maintaining adequate flows, pools and water quality will be used, along with purchase of private water rights and negotiations on timing, duration and volume of flows and drawdowns.

Strategy 13: Secure reintroduction sites.

Ecosystems selected for restoration of CRCT will be secured from upstream movement of non-native fish and from in-stream, riparian and watershed habitat degradation. Cooperative management agreements with public agencies and private organizations or individuals that have an interest in CRCT will be developed in order to ensure the long-term safety of the restored ecosystems.

Strategy 14: Remove non-native fish species.

Non-native fish in the ecosystems selected for restoration of CRCT will be removed using standard operating procedures for either rotenone or antimycin.

Strategy 15: Maintain sources of genetically pure Colorado River cutthroat.

Sources of the various genetic stocks identified throughout the range of the CRCT will be maintained in hatcheries or in designated lake and stream refugia. Hatchery stock will be replenished from its wild source no less than once every three years.

Strategy 16: Stock selected sites with genetically pure Colorado River cutthroat.

Introduction, re-introduction and transplant protocols will be developed based on criteria of maximizing genetic integrity among DPS by minimizing mixing of genetic types, and maximizing genetic variability within populations. Decisions will be based on both thorough field study and credible, in-depth genetic analyses. Ecosystems selected for restoration will be stocked with an appropriate strain of CRCT determined to be genetically pure using the complete suite of assessment techniques. Fish will be stocked either by natural dispersal from a connected water, transplant of juvenile and/or adult fish from a donor water, or stocking from a hatchery source. Indigenous populations will always be considered more valuable than stocked populations as sources for restocking. Stocked populations will be considered restored when natural recruitment has sustained them for ten years.

Planning:

Strategy 17: Develop cooperative interagency work environment.

Specific organizational arrangements, including effective feedback and accountability procedures, are needed to effectively meet the diverse challenges involved in restoring and protecting CRCT. Coordination on a multi-state, multi-jurisdictional level is needed to develop and support the Conservation Strategy. A team approach will be initiated and maintained by each state wildlife agency, with participation open to any interested person, conservation organization, tribe, or government agency. Annual or bi-annual interagency coordination meetings will be held to discuss plans and progress, researching findings and other issues.

Strategy 18: Describe existing CRCT populations and their instream/riparian habitats

Fish community and habitat characteristics, and baseline population distribution information should be collected for watersheds where CRCT populations occur. The resource management agencies currently use several databases that include such attributes along with spatial mapping systems. These databases and mapping systems should be used to make the basic descriptive information available to the organizations involved in resource management decisions. One system that covers the range of the fish across the 3-state area is described in Strategy 22.

Strategy 19: Survey waters with potential populations of CRCT.

Waters which have the potential to support CRCT populations will continue to be surveyed until all remnant populations and potential habitats have been identified.

Strategy 20: Complete genetic analyses on known or potential populations of CRCT.

The genetic status of all known or potential CRCT populations will be assessed using the most effective genetic identification techniques. Large-scale restoration plans should be guided by results of a uniformly interpreted standard analysis, with emphasis on delineating distinct population segments (DPS) consistent with federal policy. Implicit in this guideline is the need for research which examines populations with all available genetic analysis approaches so these can be calibrated with one another. In addition, a reference collection of fish from the entire tri-state area should be developed and maintained in one location.

Strategy 21: Develop list of potential restoration sites.

The databases developed in Strategy 18 will provide a basis for selecting areas for restoration of habitat for CRCT. This habitat should ideally provide chemically and physically unobstructed routes between sub-populations. A standard process for identifying and

prioritizing potential waters will be developed.

Strategy 22: Develop management plans, including genetics management.

Management plans will be developed for each of the major watersheds on which CRCT currently occur or where there is potential for restoration. These plans will include a description of the range of conditions in a particular watershed, establish a set of habitat and population objectives, and provide recommendations on watershed and habitat improvement and restoration. A genetics management plan, with appropriate consideration for DPS, will also be included. These plans will follow an environmental assessment procedure to ensure that other land use activities in the watershed are compatible with CRCT preservation and restoration. The plans will be flexible and will be updated as information and situations change.

A spatial decision support tool has been developed as a “coarse filter” to evaluate and integrate terrestrial and aquatic spatial features as part of this planning effort (N. Schmal, pers. commun.) Data on CRCT distribution and conservation status in all three states, compiled by Young et al. (1996) were imported into a relational database of ARC/INFO and linked to a hierarchical layer of surficial hydrography at the 1:100,000 scale. The database includes locations of barriers and information on purity, stocking history and other species present within identified CRCT populations along with several other layers of geographic layers including land cover, ownership, threatened and endangered species distributions, and vertebrate species richness.

Strategy 23: Prepare new inter-agency Conservation Strategies.

New inter-agency Conservation Strategies will be prepared by appropriate organizational units within each of the cooperating wildlife agencies. These strategies will include the watershed plans outlined in Strategy 22, along with commitments from the responsible land management agencies for watershed management improvements such as those outlined in Strategy 10.

Strategy 24: Evaluate and monitor land management decisions.

All land management decisions which could impact CRCT populations will include both pre- and post-project evaluation and monitoring to ensure that the habitat elements for CRCT are protected. Timber management, road construction, mineral development, and their associated impacts should be analyzed and mitigated prior to implementation. In addition, impacts to CRCT populations should be evaluated in livestock grazing management planning, with a specific focus on riparian areas. Water diversions should also be closely evaluated and monitored if adverse impacts to CRCT could occur.

Strategy 25: Reach consensus on needed processes and unresolved issues.

The need for a stability index for describing progress in CRCT conservation should be evaluated. Work may also be needed to evaluate and resolve differences between the cooperators in the approach to genetic purity interpretation. Other processes which might benefit from a consistent approach include but are not limited to: identifying and prioritizing potential restoration sites; standards, guidelines and monitoring procedures for watershed and habitat management and barrier construction and maintenance; monitoring procedures for fish populations; guidelines for preventing introduction of *M. cerebralis*; guidelines for interpretive and educational programs; introduction, re-introduction and transplant protocols; and database development.

Strategy 26: Monitor results of the Conservation Strategy.

A long-term program of monitoring CRCT ecosystem integrity will be developed to assess the effectiveness of the Conservation Strategy and to provide necessary feedback to the partner agencies.

In the context of these strategies, Colorado, Utah and Wyoming aquatic wildlife management biologists have selected waters in each of the GMUs for either protection, restoration, or conservation planning (Table 3). In total, 105 waters in Colorado, 109 waters in Utah, and 158 waters in Wyoming have been targeted for work over the next three to five years. Because of differing time frames for each planning effort, numbers of projects are not comparable on a pro rata basis. In addition, the emphasis varies between states. Utah has many potential populations without genetic purity information, while Colorado is emphasizing broodstock development in preparation for restoration activities. Wyoming's emphasis is on connecting 3rd and 4th order waters, genetic analysis for facilitation of restocking decisions, and habitat improvement. A listing of individual projects by activity category is included as Appendix B.

Table 3. Numbers of waters targeted for CRCT conservation activities in Colorado, Utah and Wyoming as of December 1, 1998.

Geographic Management Units	CRCT Conservation Activities		
	Protection	Restoration	Planning
	# waters	# waters	# waters
State of Colorado-Total	30	31	44
Colorado	0	13	28
Dolores	2	0	4
Gunnison	1	6	4
San Juan	0	1	4
White	0	4	1
Yampa	27	7	3
State of Utah-Total	13	41	55
Northeastern	8	25	42
Southeastern	5	16	13
Southern	0	0	0
State of Wyoming-Total	48	38	72
Black's Fork/Eastside	6	11	22
East Fork	2	0	1
Little Snake	4	6	18
Upper Green	6	4	2
Westside	30	17	29
Grand Total	91	110	171

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